MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS

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6. E. CELLULOSA Torr. FIG. 11. Culms terete, rarely triangular, 3–7 dm. high, 1–2 mm. wide, straw-colored or greenish: roots coarse, pale to dark brown; stolons elongated: the upper sheaths rigid, oblique, with an elongated mucronate tip, often purplish; lowest sheaths membranous and inflated or leaf-like: spikelets cylindric, 1.5–4.5 cm. long, obtuse, thicker than the culm: scales orbicular or obovate, obtuse, 4 mm. long, rigid, striated, straw-colored, with a conspicuous brown border and white scarious margins, the brown coloration sometimes wanting: style 3-fid: stamens 3: mature achene shining, brown, elliptic to obovate, lenticular, with about 20 rows of quadrangular cells, overlaid by a glass-like surface, merging at the summit into a stout, spongy beak, tipped by the short dark style-base: bristles light-brown, equaling the achene, involute, without teeth.—Ann. Lyc. N. Y. iii. 298 (1836); Britton, Journ. N. Y. Micr. Soc. v. 99 (1899); C. B. Clarke in Urb. Symb. Ant. ii. 62 (1900). *Scirpus dictyospermus* C. Wright in Sauv. Fl. Cub. 175 (1873).—Florida to Texas, West Indies, and Central America. FLORIDA: Santa Rosa Island, *Tracy* 8661; Appalachicola, Biltmore herb. (*Chapman*) 3870; Lee Co., Myers, *Hitchcock* 403; Dade Co., *A. A. Eaton* 105; S. Jacksonville, *Curtiss* 6540; Miami, *Garber* in 1877; Titusville, *Nash* 2302; W. Fla., Palm Creek, *Curtiss* 183; Key West, *Blodgett*. MISSISSIPPI: Biloxi, *Tracy* 6503; Horn Island, *Tracy* 7680; Bay of St. Louis (*Ingalls*) as *S. quadrangulatus* Michx. LOUISIANA: Lake Charles, *Cocks* 3126. TEXAS: Fredericksburg, *Engelmann* 494; *Lindheimer* 719; Rio Cabeza, *Thurber* 32 in 1850; *C. Wright* 708 (W. Tex. to El Paso), Rio Grande in 1848. BAHAMA ISLANDS: Andros, *A. E. Wight* 264; New Providence, *Britton & Brace* 505; *Britton & Brown* 305. CUBA: *C. Wright* 3763. YUCATAN: Progresso, *Gaumer* 2402.

Closely related to *E. spiralis*.[1] First described by Torrey from specimens sent from Bay of St. Louis, Mississippi, by Dr. Ingalls.

7. E. FISTULOSA (Poir.) Link. FIG. 3. Culms sharply triangular, coarse, 4–6 dm. high: roots coarse, reddish-brown: sheaths brown, membranous, rather loose, pointed at the summit: spikelets 1.5–3.5 cm. long, cylindric, acute: scales 4 mm. long, straw-colored or gray, broadly ovate, obtuse or somewhat acute, firm, striate; the margins erose but not conspicuously membranous: style 3-fid: stamens 3: achene 2–2.4 mm. long (including the style-base), obovate, turgid, green or light brown, rough, with about 20 rows of deeply pitted quadrangular cells, the apex narrowed to a neck about one-third the width of the achene, broadening again to form the base of the tri-

[1] See discussion under *E. spiralis*.

angular style: bristles coarse, usually exceeding the achene, firmly toothed.—Link in Spreng. Jahrb. iii. 78 (1820); Schultes, Mant. ii. 89 (1824); Boeckl. Linnaea, xxxvi. 472 (1869–1870); Benth. & Muell. Fl. Austr. vii. 293 (1878); C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. 626 (1893), in Durand & Schinz, Consp. Fl. Afr. v. 598 (1895), in Thiselton-Dyer, Fl. Cap. vii. 198 (1898), in Thiselton-Dyer, Fl. Trop. Afr. viii. 406 (1902) and Ill. Cyp. t. xxxv. figs. 1–4 (1908); Fernald, Rhodora, xxvii. 39–40, t. 149, figs. 5–10 (1925). *Scirpus fistulosus* Poir. Encyc. vi. 749 (1804). *S. acutangulus* and *S. medius* Roxb. Fl. Ind. (ed. Wall.) i. 216 (1820). *Baeothryon fistulosum* A. Dietr. Sp. Pl. ii. 94 (1833). *Limnochloa acutangula* Nees and *L. media* Nees in Wight, Contrib. Bot. Ind. 114 (1834). *L. fistulosa* Nees, Linnaea, ix. 294 (1835). *E. planiculmis* Steud. Cyp. 80 (1855). —West Indies and tropical South America, Asia, Africa. Cuba: *C. Wright* 3375, 3376. Mexico: Orizaba, *Botteri* 756. Panama: Prov. Panama, Chepo, *Pittier* 4557. Colombia: Polonia, *Killip & Smith* 14914; Aguasucia, *Langlassé* 87; Dept. El Valle, Calima, *Killip* 11247. Galapagos Islands: Chatham Is., *Stewart* 1080. Bolivia: Dept. Santa Cruz, Prov. Sara, *Steinbach* 7444. Paraguay: Sierra de Maracayu, *Hassler* 5676; Cordillera de Villa-Rica, *Hassler* 8589; N. Paraguay, *Fiebrig* 5349. Ceylon: *Thwaites* 3162. India: Nepal, *Wallich;* mountains of Khasia, *Hooker & Thomson.* China: Hupeh, *Henry* 4102. Japan: Katsura, *Sakuraj* 51. Sierra Leone: *Elliot* 4453. Central Africa: Djur, *Schweinfurth* 2326.

Described by Poiret (1804) from specimens collected by Du Petit-Thouars in Madagascar, and by Roxburgh (1820) from India as *Scirpus acutangulus* (*S. medius* is only a smaller form, less sharply angled). Clarke included the American plant under *Eleocharis mutata*, but Boeckeler, as noted by Fernald (l. c.), recognized the American plant as *E. fistulosa*. *E. planiculmis* was based on *Zollinger* 284 from Java. In the turgid, almost globose achenes, with coarse reticulation, and stout bristles, it seems related to *E. variegata* var. *laxiflora* and *E. philippinensis*. The characteristics differentiating *E. fistulosa* from *E. quadrangulata* and *E. mutata* have been clearly discussed by Fernald (l. c.). According to Clarke (in Thiselton-Dyer, Fl. Trop. Afr. viii. 406), "the corresponding species in Tropical America, *E. mutata*, R. Br., is exceedingly near this, and is united with it, perhaps rightly, by Boeckeler." This statement is not wholly correct; Boeckeler considered *E. mutata* synonymous with *E. spiralis* (Boeckl. l. c. 473). *Schweinfurth* 2326 from Central Africa, has achenes 2.8 mm. long, with a short neck one-half as wide as the achene, and with linear transverse cells. The bristles are without teeth and do not exceed the achene. This was described by Boeckeler,

Flora, lxii. 563 (1876) as *E. fistulosa* var. (β) *robusta* "culmo validiore 2½–3 lin. diam. haud compresso, rhizomate elongato lignoso-duro perpendicul. descendente"; it may represent a distinct species.

8. E. ROBBINSII Oakes. FIG. 5. Culms slender, 1–2 mm. wide, 2–7 dm. high, triangular, sometimes producing tufts of capillary stems which float in the water: roots either fibrous or spongy; stolons slender and elongate, the nodes inconspicuous: sheaths dull-brown; the summit oblique: spikelet 1–2.5 cm. long, acute, scarcely wider than the culm: scales few (4–9), lanceolate, 7 mm. long, greenish, striate, the margins and tip scarious, with a keel formed by 2 or 3 prominent longitudinal ridges: style 3-fid: stamens 3: achenes brown, 2–2.5 mm. long (not including the slender, elongate style-base), oblong-obovate, narrowed below the middle, lenticular, rarely triangular, turgid, with 15–18 rows of shallow, transversely linear-rectangular cells, narrowed at the apex to a neck one-half the width of the achene, broadening again to form the base of the flattened style: bristles 7, closely and firmly toothed, twice as long as the achene. —Hovey's Mag. Hort. vii. 178 (1841); Britton, Journ. N. Y. Micr. Soc. v. 99 (1889); Robinson & Fernald in Gray, Man. ed. 7, 181, fig. 240 (1908). *E. variegata* Boeckl. Linnaea, xxxvi. 471 (1869–1870) in part.—In shallow water at the borders of ponds, Nova Scotia and southern New Brunswick to Florida, chiefly on the coastal plain, and westward through central New York to Michigan, Indiana and Ontario. The following, from the numerous specimens examined, are typical. NOVA SCOTIA: Belle Isle, *Fernald et al.* 23363; Five Island Lake, *Fernald et al.* 23364; Tiddville, *Fernald & Long*, 20126; Argyle, *Pease, Long & Linder* 20124; Windsor Junction, *Howe & Lang* 404. NEW BRUNSWICK: Kendrick's Lake, St. Stephen, *Macoun* 32222 (C.). MAINE: Wilton, *Fernald* in 1894. NEW HAMPSHIRE: Wentworth, *E. F. Williams* in 1908. MASSACHUSETTS: Spot Pond, *Oakes* in 1865; Newton, *Oakes* in 1864; Dedham, *Faxon* in 1878; Plymouth, *Boott* in 1864, *Oakes* in 1839; Brewster, *Fernald* 16296; Yarmouth, *Fernald & Long*, 8841; Springfield, *M. L. Owen* in 1880. RHODE ISLAND: Cranston, *Olney*. CONNECTICUT: North Guilford, *Bartlett* in 1906; Salisbury, *Bissell* in 1906; Monroe, *Eames* in 1895. NEW YORK: Wading River, *E. S. Miller* in 1871. NEW JERSEY: Forked River, *Long* 5283; Quaker Bridge, *Parker* in 1867; Delanco, *Van Pelt* in 1907; Dennisville, *Parker* in 1866. DELAWARE: Felton, *Canby* in 1874. GEORGIA: Lee Co., near Rift, *Harper* 1068. FLORIDA: *Chapman* (Quincy, according to Chapman, Fl. S. U. S. 515, 1860). ONTARIO: Temagami Forest Reserve, *W. R. Watson* 442 (C.). MICHIGAN: Park Lake near Agricultural College, *Wheeler* in 1890; Pine Lake near Agricultural College, *Wheeler* in 1897. INDIANA: Dune Park, *E. J. Hill* in 1897 and 1898, *Umbach* in Kneucker, Cyp. et Junc. Exsicc. 225.

Described by Oakes from ponds in northern New Hampshire and

southeastern Massachusetts. In outward appearance close to *E. variegata* var. *laxiflora*, from which it differs in its smaller stature, more slender stolons, longer scales, and in the elongate, shiny, less turgid achenes conspicuously narrowed at the apex. It also has a superficial resemblance to *E. philippinensis*. Specimens collected by Wheeler in Michigan in 1890 differ from the typical *E. Robbinsii* in having the tubercle not contracted at the base, and bristles not exceeding the achene. A few of the achenes which were examined were triangular.

9. E. ELONGATA Chapm. FIG. 6. Culms very slender, usually less than 1 mm. in width, elongated, 5–8 dm. long, often floating on the surface of the water, flattened or obscurely angled: roots fibrous; stolons abundant, brown or straw-colored, elongated, with culms rising from the nodes; spikelets 1–1.5 cm. long, 2 mm. wide, acute: style 3-fid: stamens 3: scales linear, obtuse, 3.5 mm. long, striate, greenish, conspicuously bordered with brown just within the hyaline margin: achenes 1.5 mm. long including the style-base, triangular, light green, obovate (the inner face broadest, with about 12 rows of coarse transversely linear cells), abruptly narrowed at the summit to a short neck one-fourth the width of the achene, from which rises the short acute deep-brown style-base: bristles 6 or 7, equalling the achene, greenish, prominently toothed.—Fl. S. U. S. 515 (1860); Small, Fl. Se. U. S. 182 (1903).—This species is confined to Florida. The following specimens are cited from the Gray Herbarium. FLORIDA: Eustis, Lake Co., *Nash* 944; Lake Como, Putnam Co., *Curtiss* 6674; Dade Co., *Garber* in 1877; *Chapman*.

This plant is closely allied to *E. Robbinsii*. The achenes are characteristically triangular, in this respect differing from any other members of the group, although occasionally triangular achenes occur in *E. Robbinsii*.

10. E. **philippinensis**, n. sp. (FIG. 9), culmi elongati 3–5 dm. alti, circa 2 mm. diametro; radicibus brunneis, stolonibus longis nodis manifestis; vaginis ad apicem laxis; spiculis cylindricis 2–5 cm. longis circa 3 mm. crassis; squamis fusco-viridescentibus quadrifariis subulatis vel lanceolatis circa 4 mm. longis striatis carinatisque, apice exsertis subsquarrosis; achaenio 2–2.3 mm. longo obovato infra medium angustato biconvexo turgido fusco latere utroque cum cellulis hexagonis 15–20-seriatis striato, ad apicem annulo toroso truncato instructo achenio quarto parte angustiore; stylobasi complanato; setis 7, serie interiori apicem stylobasis, serie exteriori apicem achenii aequante retrorsim cum dentibus firmis scabris—*E. variegata* var. *laxiflora* Merrill, Enum. Phil. Pl. 121 (1922), not Clarke.—PHILIPPINE ISLANDS: Luzon, Prov. Bulacan, *Ramos* in Merrill, Phil. Pl.

1461; Prov. Rizal, *Merrill* in Oct. 1909; Prov. Rizal, July, 1906, *Ramos* 1112 (TYPE in Gray Herb.).

This plant differs from *E. variegata* var. *laxiflora* in the soft culms and sheaths, in the slender, elongate spikelet with its spreading scales; in the smaller, more truncate achene, with hexagonal cells (in *E. variegata* var. *laxiflora* the cells are transversely linear); and in the shorter, unequal bristles. It is also related to *E. plicarhachis* of the New World.[1] The hexagonal markings of the achenes and the slender spikelets coincide with Clarke's illustration of the Australian *E. nuda*,[2] but the scale in the illustration is blunt and bristles are lacking. *E. philippinensis* may perhaps constitute a variety of *E. nuda*.

11. E. VARIEGATA (Poir.) Presl in Oken, Isis, xxi. 269 (1828); Kunth, Enum. ii. 153 (1837); Boeckl. Linnaea, xxxvi. 470 (1869–1870), in part. *Scirpus variegatus* Poir. Encyc. vi. 749 (1804). *E. Sieberi* Kunth, Enum. ii. 153 (1837). *Bacothryon variegatum* A. Dietr. Sp. Pl. ii. 92 (1833).

I have seen no authentic material. *Scirpus variegatus* was described by Poiret from specimens collected in Madagascar by Du Petit-Thouars, which, according to Presl and Kunth, are represented in the Willdenow herbarium. In Durand & Schinz,[3] Consp. Fl. Afr. v. 601 (1895), the Asiatic material is referred to var. *laxiflora* C. B. Clarke (*E. laxiflora* Thw.), and *E. Sieberi* (based on *Sieber* 19 from Mauritius, considered by Kunth as probably identical with *Scirpus variegatus*) is included as a synonym. Typical *E. variegata*, therefore, seems to be confined to Madagascar and Mauritius. The distribution is stated by Clarke as India, China, Malaysia, Polynesia and Cuba, but the Philippine plants are clearly distinct, and so is the Cuban material (*E. plicarhachis* = *E. elata*).[4] As treated by Boeckeler,[5] *E. Robbinsii* from North America is included under *E. variegata*, and *E. Sieberi* is maintained as a distinct species.

Var. LAXIFLORA (Thw.) C. B. Clarke. FIG. 10. Culms slender, terete or obscurely angled, striate, sulcate, 3.5–6 dm. high, rigid and flexuous, about 2 mm. wide: stolons thickened: sheaths firm, closely appressed at the summit, pointed, purplish at the base: spikelets 1–2 cm. long, cylindric or somewhat angled: scales rigid, lanceolate, 5 mm.

[1] See discussion under *E. plicarhachis*.

[2] Clarke, Ill. Cyp. t. xxxv, figs. 8–10 (1909).

[3] The text was contributed by C. B. Clarke.

[4] C. B. Clarke maintained *E. elata* as a distinct species. Kew Bull. Add. Ser. viii. 105 (1908).

[5] Linnaea, xxxvi. 471 (1869–1870).

long, often keeled, straw-colored or light brown: style 3-fid: stamens 3: achene rough, elliptic, 2.5–3 mm. long (including the style-base), biconvex, turgid, light-brown, with about 20 rows of transversely linear cells, the longitudinal ridges prominent, and an annular prominence at the somewhat narrowed apex, from which the flattened brown style-base rises: bristles 6 or 7, light-brown or yellow, coarse, strongly toothed, all exceeding the beak (style-base).—Clarke in Hook. f. Fl. Brit. Ind. vi. 626 (1893)[1] and in Durand & Schinz, Consp. Fl. Afr. v. 601 (1895), not C. B. Clarke, Cont. U. S. Nat. Herb., x. 455 (1908) nor Merrill, Enum. Phil. Pl. i. 121 (1922). *Scirpus laxiflorus* Thw. Pl. Zeyl. 435 (1864). *E. ochrostachys* Steud. Cyp. 80 (1855). *E. subulata* Boeckl. Flora, xli. 412 (1858); Koorders, Excursfl. Java, i. 197 (1911).—Southeastern Asia and Fiji Islands. CEYLON: *Thwaites* 3762 (TYPE COLL.). CHINA: Hong Kong, *Hance* 13333. FIJI ISLANDS: Sandalwood Bay, *U. S. Exploring Exped.* (Wilkes Exped.) 1838–1842.

The above description is based mainly upon *Thwaites* 3762. Thwaites raised the question whether *Scirpus laxiflorus* was to be considered as a form of *Eleocharis Sieberi*.[2] This, it seems to me, is the chief reason for uniting the Du Petit-Thouars Madagascar plants with the plants from India, *i. e.* the consideration of *S. laxiflorus* as a variety of *E. variegata*. No authentic specimens of *E. variegata* have been seen by me, but the descriptions seem not applicable to the Indian material.

C. B. Clarke in Hook. f. Fl. Br. Ind. vi. 626 (1893) cites *E. ochrostachys* from "MALACCA; *Griffith*. SINGAPORE; *Ridley*,—DISTRIB. Java, Borneo. . . *Spikelet* less than ½ in.—This does not differ much from very slender examples of *S. variegata* var. *laxiflora*, except by the numerous barren stems." *E. ochrostachys* was based upon *Zollinger* 291 from Java. The specimen under this number at the Gray Herbarium from "rice fields, Java" has only one fertile culm, and on that the spikelet is very small (5 mm.). Two of the remaining culms have rudimentary development of spikelets and the plant seems to have suffered adverse conditions, which may account for the reduction of fertile culms. Both the habit and achene are identical with those of *S. laxiflora*. Boeckeler described *E. subulata* from Griffith's collection from Malacca. This plant, which was without achenes, stood in Boeckeler's estimation closest to *E. ochrostachys* Steud. and *E. planiculmis* Steud. It was reduced

[1] Ridley's combination in Journ. Sing. Asiatic Soc. xxiii. 14 (1891) is without description or reference and a *nomen nudum*.

[2] Pl. Zeylan. 435 (1864).

to synonymy with *E. ochrostachys* by C. B. Clarke. The Wilkes Exped. specimen from Fiji is identical with a plant from the same expedition labeled "*E. obtusetrigona* Nees, Organ Mts. Brazil." There is evidently a confusion of labels.

12. E. **plicarhachis** (Griseb.), n. comb. FIG. 7. Erect from an ascending spongy rootstock, often with slender elongate rhizomes: culms wiry, flexuous, striate and sulcate, 2.5–6 dm. high: sheaths usually rigid, 4–8 cm. long, purplish or straw-colored, oblique at the summit: spikelets 1–2 cm. long, about 25-flowered, narrowly cylindric, acute: scales loose, 3.5 mm. long, linear, obtuse, striate, with an obvious midrib: style 2-fid: stamens 3: achene biconvex, 2 mm. long (including beak), light-brown, orbicular to obovate, with about 12 longitudinal rows of quadrate cells with upraised edges, narrowed at the summit and surmounted by a turgid annulus-elevation from which rises the deep-brown or black lanceolate style-base: bristles 6, exceeding the achene, coarse, flat, with strong scattered teeth.—*Scirpus plicarhachis* Griseb. Cat. Pl. Cub. 239 (1866). *E. elata* Boeckl. Vidensk. Medd. Kjöb. (1871) 151 (1871). *E. variegata* Boeckl. Flora, lxiv. 78 (1881), not Presl. *E. variegata* var. *laxiflora* Clarke in Urb. Symb. Ant. ii. 62 (1900) and Contr. U. S. Nat. Herb. x. 455 (1908), not *S. laxiflorus* Thw.—West Indies and South America. CUBA: *C. Wright* 3372 (TYPE COLL.). PARAGUAY: Lake Ipacaray, *Hassler* 12570 (as *E. elata*). COLOMBIA: Dept. of Antioquia, Puerto Berrio, *F. W. Pennell* 3727.

Superficially resembling *E. philippinensis*, from which it differs in the shorter spikelet (in *E. philippinensis* the spikelet is 2.5–5 cm. long) and more appressed scales. In *E. philippinensis* the achenes are longer (2.2–3 mm.), more opaque, with hexagonal, more deeply-pitted cells and surmounted by a wider annulus and with a style-base similar in color to the achene; the bristles also are coarser and equipped with more numerous teeth. *E. plicarhachis* is also similar to *E. variegata* var. *laxiflora*, which has a much coarser culm and which differs in the opaque, turgid character of the achenes, in the more elevated annulus, in the dentition of the bristles and in the thick scaly stolons.

13. E. DULCIS (Burm. f.) Trin. FIG. 16. Culms terete, 4–12 dm. high, 3–5 mm. thick, with conspicuous joints at intervals of 2 to 5 cm. and numerous regular but inconspicuous false septa between the joints, from a short vertical rootstock with coarse reddish-brown roots and prominent elongated stolons: sheaths membranous, pointed at the tip, quickly disintegrating: spikelets 1.5–6 cm. long, cylindric, acute, of the same diameter as the culm: scales light-gray or straw-colored, obovate, acute or blunt, chartaceous, 4–5 mm. long, striate,

with a midrib: style 2- or 3-fid; stamens 3: achene 1.8–2 mm. long (excluding the style-base), lenticular, elliptic, brown, the surface with numerous small hexagonal cells, rarely with no reticulations, narrowed at the summit to an inconspicuous annular thickening about half the width of the achene, from which rises the dark-brown flattened style-base: bristles 6–8, exceeding the achene, light-brown, usually irregularly toothed.—Trin. ex Henschel, Vita Rumph. 186 (1833); Merrill, Interpret. Herb. Amb. 104 (1917), Enum. Phil. Pl. i. 119 (1922). *Cyperus dulcis* Rumph. Herb. Amb. vi. 7, t. 3, fig. 1 (1750). *Andropogon dulce* Burm. f. Fl. Ind. 219 (1768). *Hippuris indica* Lour. Fl. Cochinch. 16 (1790). *E. plantaginea* R. & S. Syst. ii. 150 (1817); Thw. Pl. Zeylan. 352 (1864); Boeckl. Linnaea, xxxvi. 474 (1869–1870), excl. the American plant; Hook. f. in Trimen, Fl. Ceylon, v. 68 (1900); C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. 625 (1893), in Durand & Schinz, Consp. Fl. Afr. v. 600 (1895) and Ill. Cyp. t. xxxiii. figs. 1–5 (1908). *Carex tuberosa* Blanco, Fl. Filip. 35 (1837), ed. 3, i. 45, t. 15 (1877), not Degl. *Scirpus plantaginoides* Rottb. Desc. et Ic. 45, t. xv. fig. 2 (1773). *S. plantagineus* Retz. Obs. v. 14 (1789). *S. tuberosus* Roxb. Fl. Ind. (ed. Wall.) i. 213 (1820). *S. tumidus* Roxb. Fl. Ind. (ed. Wall.) i. 215 (1820). *E. tumida* R. & S. Mant. ii. 86 (1824). *E. tuberosa* R. & S. Mant. ii. 86 (1824). *S. interceptus* Roxb. acc. to Nees in Wight, Contrib. Pl. Ind. 114 (1834). *E. austro-caledonica* Vieillard, Ann. Sci. Nat. sér. 4, xvi. 38 (1862) acc. to F. Mueller, Fragm. viii. 239 (1874). *E. plantaginoidea* W. F. Wight, Contrib. U. S. Nat. Herb. ix. 267 (1905). —Southeastern Asia to Madagascar, Philippine Islands, Fiji Islands. INDIA: *Thomson;* Bengal, *Griffith; Wallich* 3454ª. CHINA: Hupeh, *A. Henry* 4247; Pekin (cult.), *Bretschneider* in 1881. JAPAN: Musashi, *Watanabe* in 1888; *Sakuraj* 48. FIJI ISLANDS: *Seemann* 698. PHILIPPINE ISLANDS: Prov. Luzon, Bulacan, *Merrill* 395.

Merrill, Interpret. Herb. Amb. 104 (1917), has discussed in detail the synonymy of this species. It is variable in height and in the septation and rigidity of the culms. The achenes show variation in the surface markings. In *Seemann* 698 (Fiji Islands) the achenes are light-brown, with small but prominent square or slightly elongated cells in 50–60 rows and with blunt scales. In *Merrill* 395 the culm is lax and the pittings on the achene are entirely absent, leaving the achene smooth except for some minute striations. A specimen (*Watanabe* in 1888) from Musashi, Japan, most nearly approaches in its hexagonal pitting and texture of the bristles Clarke's illustration of *E. plantaginea*.[1] It is possible that several entities are involved in this widely distributed species. The edible tubers are raised in large quantities in the Orient.

[1] Clarke, Ill. Cyp. t. xxxiii. figs. 1–5 (1908).

14. E. SPHACELATA R. Br. FIG. 15. Culms exceeding 7 dm. in height, septate at intervals of 1 to 5 cm. with false septa interspersed: spikelets cylindric, 2.5–4 cm. long, somewhat acute: scales obovate to broadly lanceolate, obtuse, about 1 cm. long, light-brown with a deep-brown margin or sometimes with only a dark spot at the apex, scarcely striate, occasionally with a faint nerve in the middle: style 2- or 3-fid: stamens 3: achene 2–2.5 mm. long (not including the style-base), orbicular, light-brown, biconvex, turgid, covered with minute hexagonal or quadrangular reticulations, surmounted by an annular thickening from which rises the deep-brown, flattened style-base: bristles 6–9, about 4 mm. long, much exceeding the body of the achene, light-brown, sparsely toothed.—Prod. 224 (1810); Kunth, Enum. ii. 154 (1837); Hook. f. Fl. N. Zel. i. 269 (1853) and Handb. Fl. N. Zel. 300 (1864); Boeckl. Linnaea, xxxvi. 475 (1869–1870); Mueller, Frag. viii. 239 (1874); Benth. & Muell. Fl. Austral. vii. 292 (1878); C. B. Clarke, Ill. Cyp. t. xxxiv. figs. 1–6 (1909); Cheeseman, Man. Fl. N. Z. ed. 2: 216 (1925). *Scirpus sphacelatus* Spreng. Syst. i. 204 (1825). *E. biseptata* Steud. Cyp. 82 (1855). *E. subsphacelata* Steud. Cyp. 317 (1855). *E. esculenta* Vieillard, Ann. Sci. Nat. sér. 4. xvi. 37 (1862).—Australia, Tasmania and New Zealand. The specimens represented in Gray Herbarium are AUSTRALIA: Austral. felix, *Mueller*. TASMANIA: *Gunn*. NEW ZEALAND: Takapuna, North Isl., *T. Kirk* 208.

Cheeseman (l. c.) considers *E. sphacelata* "an abundant Australian and Tasmanian plant, and very closely allied to the widely diffused *E. plantaginea* R. Br." but the characters which separate the two species are not mentioned. The reticulations are variable and are often quadrate. C. B. Clarke's illustrations (l. c.) of *E. sphacelata* and *E. plantaginea* seem almost identical. In specimens at the Gray Herbarium, *E. sphacelata* is characterized by much larger spikelets, light-brown scales edged with darker brown, and coarser achenes, often with 8 or 9 bristles. F. Meuller (l. c. 239) describes the achene of the Australian *E. plantaginea* as lightly seriate-punctulate, shining-brown, in age becoming very smooth and dark, and with very narrow bristles. *E. sphacelata*, according to Mueller, extends from the Gulf of St. Vincent and Torrens Lake through the whole of Australia (except the West) to the tropic of Capricorn. The achene is round, somewhat compressed, shining, grayish-brown, punctulate, truncate below the style. The spherical starchy tubers, often an inch long, are the most esteemed of all and serve as food for the natives, either fresh or roasted. Vieillard, Ann. Aci. Nat. sér. 4. xvi. 37 (1862), in describing *E. esculenta* (represented by no. 1456 in herb. from New Caledonia) states that the culms are septate, 40–50 cm. high; the

achenes shining-black, and the bristles 8, of unequal length. The tubers are edible. According to Vieillard, these two species, *E. esculenta* and *E. austro-caledonica*, are used by the natives of New Caledonia for making the mantles which they wear during the rainy weather and during the night. These garments, which have the form of a triangular shawl, are woven together on the side next to the body, while the exterior is covered by the ends of the culms, the long stalks overlapping one another. Merrill has included *E. esculenta* as a synonym of *E. equisetina*, but judging from the large size of *E. esculenta* in Vieillard's description, it seems to belong under *E. sphacelata*.

15. E. EQUISETINA Presl. FIG. 14. Culms terete, slender, 5–8 dm. high, 2–3.5 mm. wide, septate, from a short vertical rootstock, with coarse brownish roots: sheaths membranous, usually disintegrating: spikelets 2–4 cm. long, cylindric, acute or obtuse, usually somewhat thicker than the culm: scales 4–5 mm. long, straw-colored, orbicular, with a broad rounded, almost truncate, upper margin, striate, rigid: style 2-fid: stamens 3: achene 2–2.4 mm. long (including the style-base), lenticular, elliptical, the shining brown surface punctulate, narrowed at the base, the summit passing gradually into the flattened dark-brown style-base: bristles 6–7, light-brown, as long as the beak, with soft retrorse teeth.—Rel. Haenk. i. 195 (1828); Steud. Cyp. 82 (1855); C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. 626 (1894), in Bot. Tidsk. xxiv. 85 (1901), in Phil. Journ. Sci. Bot. ii. 89 (1907); Merrill, Fl. Manila, 114 (1912), Enum. Phil. Pl. i. 120 (1922). *E. plantaginea* Vidal, Phan. Cuming .Phil. 156 (1855). *E. esculenta* Vieillard, Ann. Sc. Nat. sér. 4, xvi. 37 (1862) acc. to Merrill.—Merrill gives the range as Ceylon to Madagascar, Malaya and New Caledonia. Specimens in the Gray Herbarium are CHINA: Amoy, *Hance* 1391. PHILIPPINE ISLANDS: Manila, Kneucker (coll. *Merrill*) 224; Luzon, Prov. Sorsogon, *Elmer* 14341.

According to Presl, the plant "affinis *E. plantagineae*, differt magnitudine duplo minore, glumis magis subrotundis, stylo bifido, caryopside ancipite setarum longitudine." As represented by the specimens in the Gray Herbarium, the achenes are lenticular, not turgid, and characterized by punctulate, not reticulate, achenes.

SPECIES DOUBTFUL OR NOT SEEN

E. OBTUSETRIGONA (Lindl. & Nees) Steud. Cyp. 80 (1855). *Limnochloa obtusetrigona* Lindl. & Nees in Mart. Fl. Bras. ii.[1] 100 (1842). *E. mutata* var. *obtusetrigona* (Lindl. & Nees) Clarke in Bull. Herb. Boiss. vi. Append. 1, 20 (1898).—BRAZIL.

Steudel (l. c.) notes that Nees has taken this name from Lindley's

herbarium name, but that Nees had never seen the authentic *Salzmann* specimens upon which it was founded.

E. MITRATA (Griseb.) Clarke in Urban, Symb. Ant. ii. 62 (1909) and Ill. Cyp. t. xxxiii. figs. 10–13 (1909). *Scirpus mitratus* Griseb. Fl. Br. W. Ind. 570 (1864).—Clarke cites *Crueger* 24 from Trinidad, and includes as a synonym *E. Jelskiana* Boeckl. Linnaea, xxxviii. 376 (1874).

This species may be *E. plicarhachis* or more probably *E. fistulosa.* Grisebach describes the achene as pale, obovate-roundish, subtruncate and *produced into a tumid ring* around the tubercle, constricted at the base, biconvex, longitudinally 11–13-costate on each side, twice as long as the bristles; tubercle compressed, bluntly conical, nearly half as long as the achene, deciduous.—Based on *Crueger* 24.

E. BRASILIENSIS Boeckl. Cyp. Nov. ii. 13 (1890). "Car. juvenili oblonga obtusa *longitudinaliter striata* fusca; stylo longiusculo complanato apice bifido; perigonii setis 6, caryopsi longioribus. . . .— E vicinia H. elatae Boecklr."—In swamps near Queluz, prov. Minas Geraes, coll. *H. Schenck.*

E. ALTA Boeckl. Cyp. Nov. i. 17 (1888). The achene is not described but the plant is stated to be close to *E. variegata.*—Java, Vulcan Gede, alt. 2400 m.

According to O. Kuntze, Rev. Gen. 757 (1891) it is *Scirpus tetraquetrus* Kuntze (*E. tetraquetra* Nees).

E. NUDA Clarke, Ill. Cyp. t. xxxv. figs. 9–11 (1909).

This occurs in Australia, and is probably close to *E. philippinensis.*

E. COMPACTA R. Br. Prod. 224 (1810).

Bentham (Fl. Austral.) considers it a synonym of *E. variegata.* In the Gray Herbarium is a specimen from India (Punjab, coll. *T. Thomson*) labeled *E. compacta* Br., but this specimen, although superficially resembling members of the series *Mutatae*, clearly is not a member of it.

E. PERUVIANA Clarke, Kew Bull. Add. Ser. viii. 105 (1908) (name only).

I have not been able to find a description of this species.

E. SAGOTII Clarke, Kew Bull. Add. Ser. viii. 20 (1908).—FRENCH GUIANA.

GEOGRAPHICAL DISTRIBUTION OF SERIES MUTATAE

This series comprises about twenty species of mostly coarse perennial plants with prominent stolons, and, in the case of *E. dulcis* of the Orient and *E. sphacelata* of the Australian region, producing

conspicuous tubers which are utilized for food. The plants are always more or less immersed, varying in the mechanical structure of the culm from terete jointed types which have a superficial resemblance to species of *Equisetum*, to sharply triangular or quadrangular forms. They occur chiefly in warm temperate or subtropical regions from which they extend into the tropics and into the cooler temperate regions. The center of distribution is apparently in subtropical and warm-temperate eastern America, but three species occur in temperate North America along the Atlantic Coastal Plain and inland to the Great Lakes or the Mississippi Valley; *E. Robbinsii*, which has the greatest range, extending to Nova Scotia, Ontario and Michigan. In Florida alone there are five distinct species (*E. elongata*, *E. Robbinsii*, *E. cellulosa*, *E. equisetoides* and *E. quadrangulata*). Many are superficially alike and there has been a tendency to consider Old World and New World species as identical. However, *E. fistulosa* seems to be the only one common to both hemispheres.

EXPLANATION OF PLATE 188

(Achenes × 10)

Fig. 1, ELEOCHARIS EQUISETOIDES, Massachusetts, *Morong;* 2, E. INTERSTINCTA, Cuba, *Wright* 710; 3, E. FISTULOSA, Ceylon, *Thwaites* 3162; 4, E. QUADRANGULATA, Massachusetts, *Pl. Exsicc. Gray*, 133; 5, E. ROBBINSII, Massachusetts, *Fernald*, 16,296; 6, E. ELONGATA, Florida, *Nash* 944; 7, E. PLICARHACHIS, Cuba, *Wright*, 3372; 8, E. MUTATA, Porto Rico, *Sintenis* 4942; 9, E. PHILIPPINENSIS, Luzon, *Ramos* 1112; 10, E. VARIEGATA var. LAXIFLORA, Ceylon, *Thwaites* 3762; 11, E. CELLULOSA, Florida, *Curtiss* 6540; 12, E. SPIRALIS, Borneo, *Clemens* 9716; 13, E. FISTULOSA var. ROBUSTA, Djur, *Schweinfurth* 2326; 14, E. EQUISETINA, Philippines, *Elmer* 14,341; 15, E. SPHACELATA, New Zealand, *Kirk* 208; 16, E. DULCIS, Japan, *Watanabe.*

(*To be continued.*)

TWO VARIANTS OF RANUNCULUS RECURVATUS

C. A. WEATHERBY

RANUNCULUS RECURVATUS Poir., as it occurs commonly in moist woodlands and along shaded brooks, has the stem villous with spreading, mostly 2–3-celled hairs, and is described as "pubescent" by Poiret and subsequent authors. As in many other cases, however, this pubescence is variable in quantity, and Mr. E. B. Harger has called my attention to the existence of a form in which the stem is wholly glabrous, at least up to the first flower-bearing branch. It differs from the typical form in no other respect than lack of pubes-